



INVESTOR IN PEOPLE

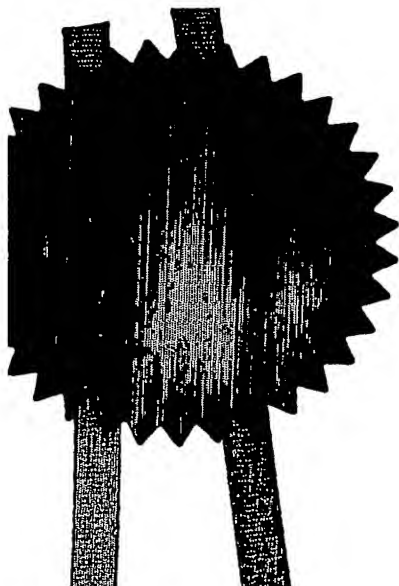
The Patent Office
Concept House
Cardiff Road
Newport
South Wales
NP10 8QQ

I, the undersigned, being an officer duly authorised in accordance with Section 74(1) and (4) of the Deregulation & Contracting Out Act 1994, to sign and issue certificates on behalf of the Comptroller-General, hereby certify that annexed hereto is a true copy of the documents as originally filed in connection with the patent application identified therein.

In accordance with the Patents (Companies Re-registration) Rules 1982, if a company named in this certificate and any accompanying documents has re-registered under the Companies Act 1980 with the same name as that with which it was registered immediately before re-registration save for the substitution as, or inclusion as, the last part of the name of the words "public limited company" or their equivalents in Welsh, references to the name of the company in this certificate and any accompanying documents shall be treated as references to the name with which it is so re-registered.

In accordance with the rules, the words "public limited company" may be replaced by p.l.c., plc, P.L.C. or PLC.

Re-registration under the Companies Act does not constitute a new legal entity but merely subjects the company to certain additional company law rules.



Signed

Dated

6 January 2005

BEST AVAILABLE COPY

Patents Form 1/77

Patents Act 1977
(Rule 16)



26NOV03 E854909-2 000022
P01/7700 0.00-0327401.6

Request for grant of a patent

(See the notes on the back of this form. You can also get an explanatory leaflet from the Patent Office to help you fill in this form)



The Patent Office

Cardiff Road
Newport
South Wales
NP10 8QQ

1. Your reference

NIS/JG/JY/40793

2. Patent application number
(The Patent Office will fill in this part)

0327401.6

3. Full name, address and postcode of the or of each applicant (underline all surnames)

MALCOLM DOUGLAS EMMETT
11 ST CLEMENTS ROAD
BENFLEET
ESSEX SS7 5XA

08760183001

Patents ADP number (if you know it)

If the applicant is a corporate body, give the country/state of its incorporation

4. Title of the invention

SILENCER FOR EXHAUST SYSTEMS

5. Name of your agent (if you have one)

FJ Cleveland

"Address for service" in the United Kingdom to which all correspondence should be sent (including the postcode)

40-43 Chancery Lane
London WC2A 1JQ

Patents ADP number (if you know it)

07368855001

6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and (if you know it) the or each application number

Country

Priority application number
(if you know it)

Date of filing
(day / month / year)

7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application

Number of earlier application

Date of filing
(day / month / year)

8. Is a statement of inventorship and of right to grant of a patent required in support of this request? (Answer 'Yes' if:

NO

- a) any applicant named in part 3 is not an inventor, or
 - b) there is an inventor who is not named as an applicant, or
 - c) any named applicant is a corporate body.
- See note (d))

Patents Form 1/77

Patents Form 1/77

9. Enter the number of sheets for any of the following items you are filing with this form. Do not count copies of the same document

Continuation sheets of this form	-
Description	8
Claim(s)	4
Abstract	-
Drawing(s)	2 + 2 <i>JMC</i>

10. If you are also filing any of the following, state how many against each item.

Priority documents	-
Translations of priority documents	-
Statement of inventorship and right to grant of a patent (Patents Form 7/77)	-
Request for preliminary examination and search (Patents Form 9/77)	✓
Request for substantive examination (Patents Form 10/77)	-
Any other documents (please specify)	-

11. I/We request the grant of a patent on the basis of this application.

Signature

F J Cleveland
F J Cleveland

Date

25.11.2003

12. Name and daytime telephone number of person to contact in the United Kingdom

Dr N I Smith

020 7405 5875

Warning

After an application for a patent has been filed, the Comptroller of the Patent Office will consider whether publication or communication of the invention should be prohibited or restricted under Section 22 of the Patents Act 1977. You will be informed if it is necessary to prohibit or restrict your invention in this way. Furthermore, if you live in the United Kingdom, Section 23 of the Patents Act 1977 stops you from applying for a patent abroad without first getting written permission from the Patent Office unless an application has been filed at least 6 weeks beforehand in the United Kingdom for a patent for the same invention and either no direction prohibiting publication or communication has been given, or any such direction has been revoked.

Notes

- If you need help to fill in this form or you have any questions, please contact the Patent Office on 08459 500505.
- Write your answers in capital letters using black ink or you may type them.
- If there is not enough space for all the relevant details on any part of this form, please continue on a separate sheet of paper and write "see continuation sheet" in the relevant part(s). Any continuation sheet should be attached to this form.
- If you have answered 'Yes' Patents Form 7/77 will need to be filed.
- Once you have filled in the form you must remember to sign and date it.
- For details of the fee and ways to pay please contact the Patent Office.

Silencer for exhaust systems

This invention relates to silencers for exhaust systems.

Exhaust systems on modern vehicles are often provided with silencers
 5 connected to their exhaust systems in order to reduce noise pollution into the
 surrounding environment. When an engine of a vehicle is running hot gases
 pass through the exhaust system. These gases have a tendency to condense on
 the internal surfaces of the exhaust system resulting in fluids, particularly
 water, collecting in the exhaust system and running into the silencer.

10 Collection of water in the silencer is undesirable as it tends to cause the
 silencer unit to rust, greatly reducing the lifetime of the silencer unit.

One solution to this problem is to provide a hole in the silencer of the
 silencer through which fluid may escape. However, puncturing the silencer
 casing reduces the effectiveness of the silencer and results in greater noise
 15 pollution.

It is an object of the present invention to alleviate problems associated
 with previous silencers.

According to a first aspect of the present invention there is provided a
 silencer for an exhaust system, comprising a fluid outlet and control means for
 20 opening and closing the fluid outlet, the silencer arranged such that the fluid
 outlet is closed by the control means when the exhaust system is in use and the

fluid outlet is opened by the control means when the exhaust system is idle.

Fluid which has accumulated in the silencer may escape through the fluid outlet when the exhaust system is idle. When the exhaust system is in use, the fluid outlet is closed, and this helps to avoid or minimise any

5 degradation in the performance of the silencer.

The control means may comprise temperature dependent control means arranged to open and close the fluid outlet in dependence with the temperature of the silencer. When the exhaust system is in use, hot fumes pass through the silencer, heating the silencer. However, when the system is idle, the silencer is
10 no longer heated by fumes and the silencer cools.

The fluid outlet may comprise an aperture formed in the casing of the silencer.

The temperature dependent control means may comprise a bi-metallic strip. The bi-metallic strip may comprise a plug for closing the aperture.

15 The bi-metallic strip may be provided adjacent an internal surface of casing of the silencer. In this case, the bi-metallic strip is conveniently protected by the silencer casing.

The bi-metallic strip may be provided adjacent an external surface of casing of the silencer. Mounting the bi-metallic strip on the external face of the
20 silencer casing is particularly convenient if the bi-metallic strip is being fitted after initial production of the silencer or whilst the silencer is fitted on a

vehicle or other exhaust system.

Where the bi-metallic strip is fitted on an external surface of the silencer casing, an external cover may be provided to protect the bi-metallic strip. The external cover may comprise an aperture to allow passage of fluid
5 away from the bi-metallic strip.

The silencer may be a silencer for a vehicle exhaust system.

According to a second aspect of the present invention there is provided a method of adapting a silencer for an exhaust system, comprising the steps of:
providing the silencer with a fluid outlet; and

10 providing the silencer with control means for opening and closing the fluid outlet, whereby the silencer is arranged such that the fluid outlet is closed by the control means when the exhaust system is in use and the fluid outlet is opened by the control means when the exhaust system is idle.

The step of providing the silencer with control means may comprise the
15 step of providing the silencer with temperature dependent control means and arranging the temperature dependent control means to open and close the fluid outlet in dependence with the temperature of the silencer.

The step of providing a fluid outlet in the silencer may comprise the step of forming an aperture in casing of the silencer.

20 The step of providing temperature dependent control means may comprise the step of providing a bi-metallic strip. The bi-metallic strip may

comprise a plug for closing the aperture.

The step of providing the silencer with a bi-metallic strip may comprise the step of arranging the bi-metallic strip adjacent to an internal surface of casing of the silencer.

5 The step of providing the silencer with a bi-metallic strip may comprise the step of arranging the bi-metallic strip adjacent to an external surface of casing of the silencer.

10 The step of providing the silencer with a bi-metallic strip may additionally comprise the step of providing an external cover, which external cover comprises an aperture to allow passage of fluid away from the bi-metallic strip.

The method may be a method of adapting a silencer for a vehicle exhaust system.

15 A silencer embodying the present invention will now be described, by way of example only, with reference to the accompanying figures in which:

Figure 1 shows a silencer fitted to an exhaust system, when the exhaust system is in use;

Figure 2 shows the silencer shown in Figure 1, when the exhaust system is idle;

20 Figure 3 shows a second silencer fitted to an exhaust system, when the exhaust system is in use; and

Figure 4 shows the second silencer, when the exhaust system is idle.

Figure 1 shows a silencer 1 comprising silencer casing 11, an exhaust inlet 12 and an exhaust outlet 13. The exhaust inlet 12 and exhaust outlet 13 are connected to an exhaust system (not shown). Figure 1 shows the silencer 1
5 fitted to an exhaust system when the exhaust system is in use. In this configuration, a lower portion of the silencer casing 11 has an aperture 14. Typically the aperture has a diameter of approximately 0.6 cm (1/4 inch).

On the external surface of the silencer casing 11 is provided a bi-metallic strip 2. One end of the bi-metallic strip 2 is attached by a screw 21 to
10 the external surface of the silencer casing 11. At the opposite end of the bi-metallic strip 2 to the screw 21 the bi-metallic strip has a rivet stopper 22. The bi-metallic strip 2 is arranged on the external surface of the silencer casing 11 so that the rivet stopper 22 is aligned with the aperture 14 in the silencer casing 11.

15 An external cover 3 is provided surrounding the bi-metallic strip 2 and attached at its periphery to the external surface of the silencer casing 11. The external cover 3 has a drainage hole 31 on a lower surface of the external cover 3 near to the aperture 14.

When the exhaust system is in use hot fumes pass through the exhaust
20 system and through the silencer 1. As the fumes pass through the exhaust system and the silencer 1 there is a tendency for fluids to condense on the

internal surfaces of the exhaust system and the silencer 1. These fluids can accumulate in the silencer 1.

Figure 2 shows the silencer 1 when the exhaust system is idle and the silencer 1 is cool. At this temperature, the bi-metallic strip 2 is curved and bends away from the external surface of the silencer casing 11. The rivet stopper 22 provided at one end of the bi-metallic strip 2 is held a short distance from the aperture 14. Any fluid which may be present in the silencer 1 may drain through the aperture 14, past the bi-metallic strip 2 and through the drainage hole 31 in the external cover 3.

When the exhaust system is in use hot fumes pass through the silencer 1 heating the casing of the silencer 11 and the bi-metallic strip 2. As the bi-metallic strip 2 is heated, the bi-metallic strip straightens out moving the rivet stopper 22 into the aperture 14. When the silencer 1 reaches its normal operating temperature the rivet stopper 22 has moved to substantially close the aperture 14. In this configuration, fluids may accumulate in the silencer 1, though this tendency is reduced by the temperature of the silencer casing 11. The sealing of the aperture 14 by the rivet stopper 22 allows the silencer 1 to run quietly.

The silencer 1 may be formed from a conventional silencer unit. In order to adapt a conventional silencer unit having a silencer casing 11, an aperture 14 is drilled in the silencer casing 11. A second, guide, hole may be

drilled in the silencer casing 11 at a desired location to receive a screw 21. To complete the adaption of the conventional silencer, a bi-metallic strip 2 having a rivet stopper 22 disposed at one end is attached to the silencer casing 11 by a screw 21 passing through the other end of the bi-metallic strip 2. The screw 21 is screwed into the guide hole, the position of the guide hole having been selected such that when a bi-metallic strip 2 is fitted the rivet stopper 22 will align with the aperture 14.

Optionally an external cover 3 may be provided to protect the bi-metallic strip 2.

Figure 3 shows a second silencer, which is the same as that shown in Figures 1 and 2 except that the bi-metallic strip 2 is attached by the screw 21 to the internal surface rather than the external surface of the silencer casing 11. Because the bi-metallic strip is now provided on the inside of the silencer casing 11, an external cover 3 is no longer provided as the bi-metallic strip is adequately protected by the silencer casing 11. The same reference numerals are used in Figures to indicate corresponding parts.

The operation of the second silencer 4 is similar to that of the silencer 1. Figure 4 shows the second silencer when the exhaust system is idle and the silencer 4 is cool. The bi-metallic strip is cool and curves away from the internal surface of the silencer casing 11. The rivet stopper 22 of the bi-metallic strip 2 is displaced from the aperture 14. When the exhaust system is

in use as shown in Figure 3, the bi-metallic strip 2 is heated by fumes from the exhaust system. When heated the bi-metallic strip straightens moving the rivet stopper 22 to cover the aperture 14.

Any fluid accumulated in the second silencer 4 may escape via the
5 uncovered aperture 14 when the exhaust system is idle and the silencer is cool. However, when the exhaust system is in operation, the aperture 14 is covered by the rivet stopper 22, enhancing the quieting effect of the silencer.

CLAIMS

1. A silencer for an exhaust system, comprising a fluid outlet and control means for opening and closing the fluid outlet, the silencer arranged such that
5 the fluid outlet is closed by the control means when the exhaust system is in use and the fluid outlet is opened by the control means when the exhaust system is idle.
2. A silencer according to claim 1 wherein the control means is
10 temperature dependent control means arranged to open and close the fluid outlet in dependence with the temperature of the silencer.
3. A silencer according to claim 1 or claim 2 wherein the fluid outlet comprises an aperture formed in the casing of the silencer.
15
4. A silencer according to claim 2 wherein the temperature dependent control means comprises a bi-metallic strip.
5. A silencer according to claim 4 when dependent on claim 3 wherein the
20 bi-metallic strip comprises a plug for closing the aperture.

6. A silencer according to claim 4 or claim 5 wherein the bi-metallic strip is provided adjacent an internal surface of casing of the silencer.

7. A silencer according to claim 4 or claim 5 wherein the bi-metallic strip is provided adjacent an external surface of casing of the silencer.

8. A silencer according to claim 7 wherein an external cover is provided to protect the bi-metallic strip, the external cover comprising an aperture to allow passage of fluid away from the bi-metallic strip.

9. A silencer according to any preceding claim wherein the silencer is a silencer for a vehicle exhaust system.

10. A method of adapting a silencer for an exhaust system, comprising the steps of:

providing the silencer with a fluid outlet; and

providing the silencer with control means for opening and closing the fluid outlet, whereby the silencer is arranged such that the fluid outlet is closed by the control means when the exhaust system is in use and the fluid outlet is opened by the control means when the exhaust system is idle.

11. A method according to claim 10 wherein the step of providing the silencer with control means comprises the step of providing the silencer with temperature dependent control means and arranging the temperature dependent control means to open and close the fluid outlet in dependence with the temperature of the silencer.

12. A method according to claim 10 or claim 11 wherein the step of providing a fluid outlet in the silencer comprises the step of forming an aperture in casing of the silencer.

13. A method according to claim 11 wherein the step of providing temperature dependent control means comprises the step of providing a bi-metallic strip.

14. A method according to claim 13 when dependent on claim 12 wherein the bi-metallic strip comprises a plug for closing the aperture.

15. A method according to claim 13 wherein the step of providing the silencer with a bi-metallic strip comprises the step of arranging the bi-metallic strip adjacent to an internal surface of casing of the silencer.

16. A method according to claim 13 wherein the step of providing the silencer with a bi-metallic strip comprises the step of arranging the bi-metallic strip adjacent to an external surface of casing of the silencer.

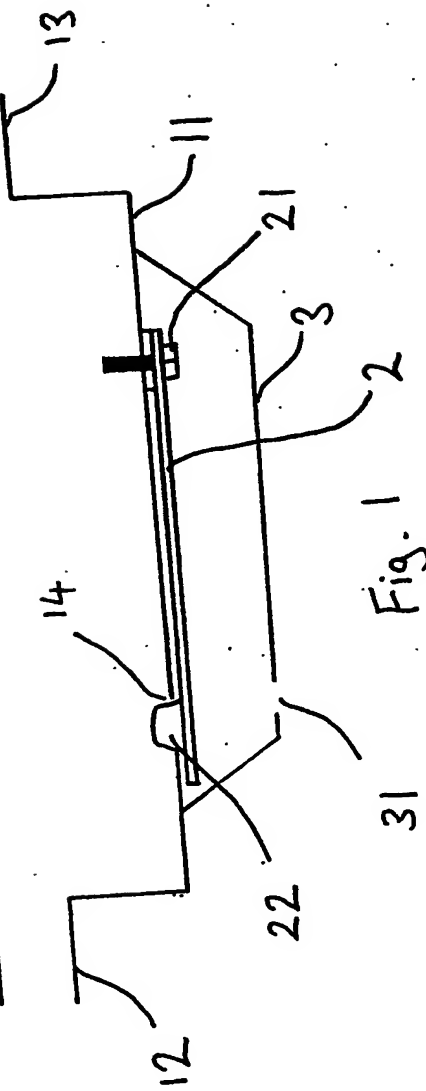
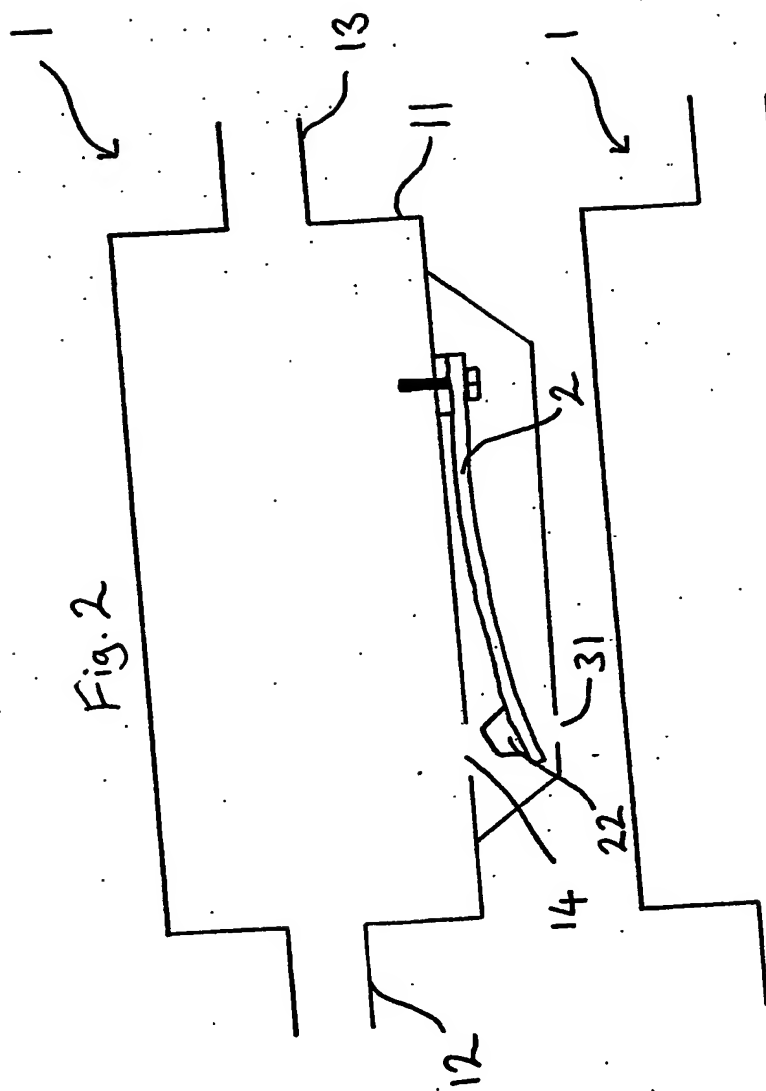
5 17. A method according to claim 16 wherein the step of providing the silencer with a bi-metallic strip additionally comprises the step of providing an external cover, which external cover comprises an aperture to allow passage of fluid away from the bi-metallic strip.

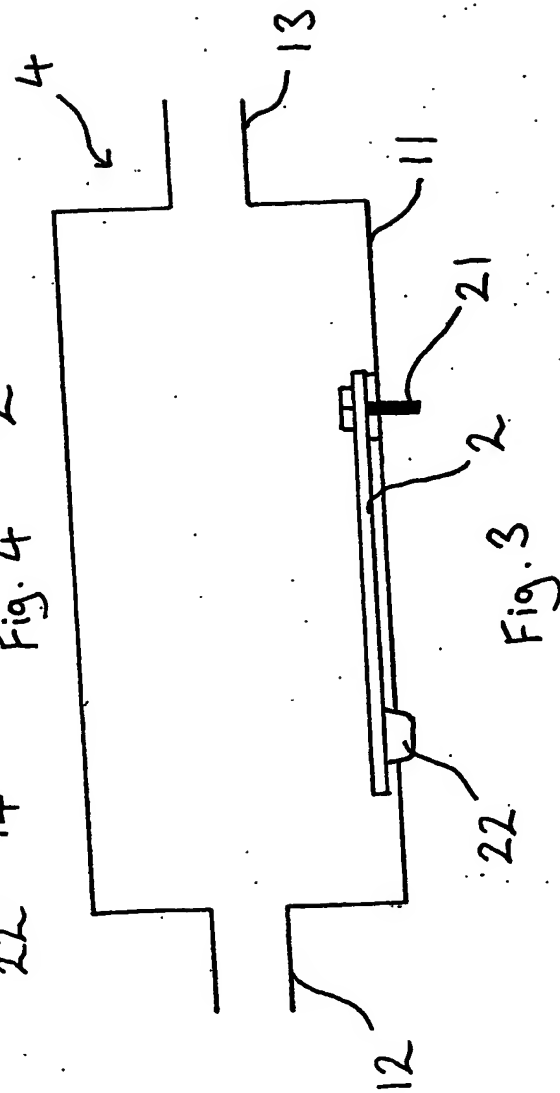
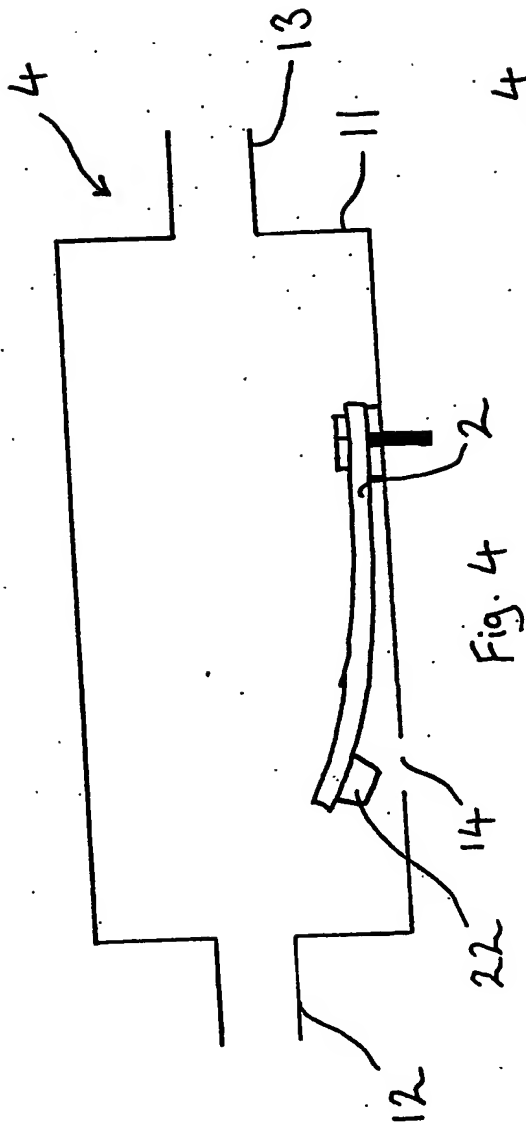
10 18. A method according to any one of claims 10 to 20 wherein the method is a method of adapting a vehicle exhaust system.

19. A silencer for an exhaust system substantially as hereinbefore described with reference to and/or as shown in the accompanying drawings.

15

20. A method of adapting a silencer for an exhaust system substantially as herein before described with reference to and/or as shown in the accompanying drawings





Document made available under the Patent Cooperation Treaty (PCT)

International application number: PCT/GB2004/004976

International filing date: 25 November 2004 (25.11.2004)

Document type: Certified copy of priority document

Document details: Country/Office: GB
Number: 0327401.6
Filing date: 25 November 2003 (25.11.2003)

Date of receipt at the International Bureau: 02 March 2005 (02.03.2005)

Remark: Priority document submitted or transmitted to the International Bureau in compliance with Rule 17.1(a) or (b)



World Intellectual Property Organization (WIPO) - Geneva, Switzerland
Organisation Mondiale de la Propriété Intellectuelle (OMPI) - Genève, Suisse

**This Page is Inserted by IFW Indexing and Scanning
Operations and is not part of the Official Record**

BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

- ☒ **BLACK BORDERS**
- ☐ **IMAGE CUT OFF AT TOP, BOTTOM OR SIDES**
- ☐ **FADED TEXT OR DRAWING**
- ☐ **BLURRED OR ILLEGIBLE TEXT OR DRAWING**
- ☐ **SKEWED/SLANTED IMAGES**
- ☒ **COLOR OR BLACK AND WHITE PHOTOGRAPHS**
- ☐ **GRAY SCALE DOCUMENTS**
- ☐ **LINE(S) OR MARK(S) ON ORIGINAL DOCUMENT**
- ☐ **REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY**
- ☐ **OTHER: _____**

IMAGES ARE BEST AVAILABLE COPY.

As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.